



Office Preparedness for Pediatric Emergencies

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North Carolina Emergency Medical Services for Children

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Section 1 – INTRODUCTION

Emergency Medical Services for Children (EMS-C) in Georgia

EMS-C Background in Georgia:

Federally funded initiative since 1994 with the primary focus of establishing and institutionalizing pediatric (infant to adolescents) issues within the existing emergency medical services infrastructure. Georgia's EMS-C program is based on three goals for the improvement of emergency services and reduce the morbidity and mortality for our pediatric population in Georgia.

- Strengthen the components of an emergency medical services for children to include tiered training for all levels of emergency care providers, public information and education programs targeted at injury and illness prevention and building the capacity of the EMS system to address the needs of pediatric patients.
- Establish components within the current EMS system that provides or increases services to previously underserved and impoverished areas of the state.
- Support strategic planning initiatives to assure consideration and incorporation of the special needs of children in continued system development.

EMS-C and the Primary Care Provider

The Georgia EMSC program recognizes that office and clinic based primary care providers are vitally important members of the pediatric emergency care team in our state. Children with potentially life threatening illnesses and injuries are brought to primary care offices by parents or care providers who are seeking help from health care professionals whom they know and trust. The office site then serves as an entry to the emergency care system and it is here that vital, perhaps even life dependent pre-hospital care, is provided. From the office, EMS is accessed and care is transferred to other health care professionals who continue to deliver emergency care. Ideally, the child is then transported to a facility where advanced pediatric care can be provided in the Emergency Department and subsequently in a pediatric intensive care unit if necessary. The spectrum of EMS-C care continues after resolution of the acute illness with rehabilitation, and includes reintegration of children, who may now have special health care needs, into the community.

We recognize that pediatric primary care providers serve many roles in the emergency care system in addition to offering resuscitative care. Primary care providers serve as educators to teach children and families about issues such as injury prevention and recognition of pediatric emergencies. This information gives families the tools to know when to access EMS directly. Pediatric primary care providers, offer critical support to children and families who find themselves in the midst of the emergency care system in coordinating efforts of the subspecialist and multidisciplinary teams. They provide continuity to the child and family as he or she progresses from critical care into rehabilitation. Primary care providers then serve as strong child advocates making sure

that children receive the special services necessary to reintegrate them into the community.

The Purpose of the Course

Through this workshop entitled “Office Preparedness for Pediatric Emergencies”, we hope to bring pediatric primary care providers and emergency care providers in our state closer together with a common goal: *to improve the emergency care offered to each and every child in Georgia*. We believe that preparation of the office and the office staff is crucial in order to offer children the best possible outcome following an emergency situation. We wish to thank you for all your efforts in helping to make a real difference in the lives of our children.

Section 2 – OVERVIEW OF OFFICE PREPAREDNESS

Preparing the Office for Pediatric Emergencies

A six month old female has had fever, vomiting, diarrhea for two days. She has been sleeping all morning and her mother was unable to get her to take a bottle at all. She was brought to the office today because mom was having difficulty waking her up.

Mom appears very concerned and frightened as she gives this information to the receptionist.



- ♥ Are your non-medically trained office personnel prepared to respond to this or other emergency situations?
- ♥ Do you have the necessary equipment and medicines needed to manage this infant? Are they readily available?
- ♥ Who will call 911 or access EMS? What level of pediatric care is provided by your local EMS system?

It takes more than good resuscitation knowledge and skills to provide high quality care during a pediatric emergency. Your office staff needs to be prepared: they need to have adequate knowledge, training and resources to respond to an emergency. We will review several items which should be in place to ensure that your staff and your office are prepared to handle a pediatric emergency.

Recognition

The first person to assess patients arriving in the office may be the least medically sophisticated employee – the secretary or receptionist. These employees should be able to recognize emergencies and know how to summon help.

Secretaries or receptionists should be instructed about signs and symptoms that may signal a pediatric emergency such as:

- ♥ extremely labored breathing
- ♥ cyanosis or pale lips
- ♥ stridor or audible wheezing
- ♥ stupor or coma
- ♥ seizures
- ♥ vomiting after a head injury
- ♥ uncontrollable bleeding

Response Plan

A clear **response plan** should be in place for any emergency recognized in the office. Each member of the office staff should have a specific role in the management of the emergency.

1. Determine who is responsible for calling 911 or accessing EMS
2. Identify medical staff member who should be notified by the receptionist who recognizes an emergency.
3. Establish and post protocols regarding:
 - a. Accessing EMS
 - b. Notification of provider or nurse within the office/clinic
4. Have contingency plans for staff if no physician is in the office.
5. Have office nurse periodically check the waiting area.
6. Pre-assign roles for a “resuscitation team”
 - ♥ Primary care provider “runs the code”; provides medical direction
 - ♥ Office nurse – draws up, administers medications, fluids
 - ♥ Aide – assist care provider, perform chest compressions
 - ♥ Secretary – activate EMS system; records events during resuscitative efforts
7. Be sure that staff members are adequately trained to fulfill their roles in an emergency.
 - ♥ Provide training for the receptionist to identify infants and children in distress
 - ♥ Don’t assume medical providers are experienced in handling pediatric emergencies. Determine skill level and knowledge of newly employed medical personnel.
 - ♥ Be sure all office staff have received CPR training and all medical staff have received pediatric advanced life support training.
 - ♥ Supplement certification and teaching specific to the most common problems seen in your office.
 - ♥ Support re-certification in basic and advanced life support training for medical care providers.
8. Personnel designated to call 911 should receive prior training in accessing the EMS System:
 - a. Teach staff about your local EMS system
 - ♥ First Responders
 - ♥ EMT’s
 - ♥ Paramedics
 - b. Staff should be able to provide information needed by EMS communications or dispatcher:
 - ♥ Office address
 - ♥ Patient’s age, condition, vital signs
 - ♥ Transport destination
 - ♥ Need for advanced life support unit (if appropriate)
9. Office personnel should call ahead to the receiving hospital as soon as possible and report to the receiving physician.

Equipment and Supplies

Trained personnel must have appropriate equipment and medications to use at the time of an emergency.

- ♥ All office staff members must know where resuscitation equipment is located. A resuscitation room can be pre-stocked in an organized way, or an equipment box can be prepared and taken to the site of the resuscitation.
- ♥ Equipment and medications should be organized to the size of the child.
- ♥ Each office should develop a system to ensure that all equipment, medicines, and fluids are re-stocked and readily available.

Provider Skills

The primary care provider must be able to provide basic airway management and initiate the management of shock. Even if these skills were obtained in training, it takes practice to maintain them. Since office emergencies happen so infrequently, providers need to find a way to be sure resuscitation skills and knowledge are current and kept up to date. Courses such as Pediatric Advanced Life Support and Emergency Nurse Pediatric Course provide an excellent opportunity to renew knowledge and skills. These courses focus on early recognition of shock and respiratory distress and addressing assessment and management issues. Additionally, an increasing number of CME opportunities in pediatric emergency care are offered at the state and regional levels for local providers.

Maintaining Readiness

The courses described above can help maintain provider knowledge and skills, but it takes more than this to maintain a state of “office readiness” for a pediatric emergency. The best way to ensure readiness is to **PRACTICE!** Here are some suggestions:

1. Mock Codes – provide an opportunity to walk staff members through an emergency scenario. A mannequin can be used to make the practice session more “life-like”. Staff members need to be able to identify their tasks and responsibilities during the emergency and demonstrate communication skills, medical skills, etc.
2. Critique, Action Plans – Team members should critique each other’s performances and specific action plans for improvement and problem solving should result from the effort (i.e., training needs, skills practice, equipment needs, organizational issues).
3. Scavenger Hunt – another method to identify equipment and/or medication needs. A staff member is given a list of items needed in an emergency and given a set time to find them.

Documentation

Documentation must be a part of office training and mock codes. Complete and accurate information regarding resuscitative efforts is vital for ongoing patient care and transfer of care. Emergency situations are the most difficult to document properly: stress levels are high; there are often not enough trained assistants; other patients in the waiting room must be tended to. When documenting, one should:

- ♥ Record dates and times of treatments, calls for transport and transfer
- ♥ Record stabilization attempts, medication dosages and response, fluid volumes and the child's weight
- ♥ Note consultations obtained and record conversations or explanations given to the family
- ♥ Document patient's condition at time of departure from office

Designate a recorder during every mock code and critique the documentation as well as the code itself. In addition, keep records of mock codes held in the office with a note of "lessons learned" from each one. If there has been a recent change in office equipment (forms, etc.), you may want to include these as specific teaching points following a mock code.

Emergency Medical Services

If a child requires resuscitation in your office, you need help from other health care providers to ensure the best possible outcome. Local EMS personnel can provide you with the help you need.

You and your staff should become familiar with the local EMS system. EMS personnel that respond to pediatric emergencies may include volunteers and/or paid personnel such as police officers, firefighters, EMTs, paramedics or other private or public personnel. The level of training varies among these providers in our state: first responders may have been trained only in CPR and basic first aid; conversely, Emergency Medical Technicians (EMTs) or Paramedics (EMT-P) have substantially more comprehensive training. In the case of EMT-P this can be in excess of 1000 hours of instruction. Paramedics, under medical control, can intubate, start IV and IO catheters, administer IV and nebulized medications, defibrillate, and perform other advanced skills. Generally, when you request an "Advanced Life Support" team, the responders will have relatively higher levels of training.

Only a small number of EMS calls in Georgia are for pediatric patients (10-12%). You can help EMTs and paramedics gain experience in working with children by inviting them into your office. Just as in many office and clinical settings, limited pediatric equipment is available on ambulances.

EMS personnel are well trained in resuscitative skills and are important members of the health care team. However, they cannot help you care for your patients who may be critically ill unless they are called. If your area has 911 service, EMS may be accessed as soon as your office recognizes a pediatric emergency. If your community does not

yet have a 911 emergency number (approximately 20% of our state does not), dial your community's seven digit emergency EMS access number.

Teach children and parents to call 911 or other appropriate emergency numbers for pediatric emergencies. Children still arrive far too often at the Emergency Department in severe distress, having been transported by private vehicle with only one adult (the driver) in the car!

Section 3 – EMERGENCY MEDICAL SERVICES

EMS, EMS-C and Primary Care Providers

Introduction

As a pediatric primary care provider you see children who suffer from all degrees of illness or injury: from a mild cough to severe asthma; from a scratch or scrape to a severe laceration. You may one day find yourself in the position of initiating emergency care, and when this happens, who can you call for help? Are you aware of the capabilities of the EMS System in your community? Do the parents of your patients know when to call you and when to call EMS directly? Are EMS and EMS-C integrated within your community?



As a child advocate and pediatric primary care provider, you can help assure that appropriate emergency care is delivered to pediatric patients in your community. The system currently in place to provide this is the Emergency Medical Services System.

Components of EMS

EMS systems have been evolving in this country since the early 1970s. The basic parts of an EMS System include: (1) Public Access. This is the mechanism the public uses to obtain EMS services. It may be a seven digit telephone number or, more commonly, a basic or enhanced 911 telephone system. (2) Communication Center (Dispatch). This is a subsystem where a person within an organization actually directs the EMS unit and personnel to respond to the incident. Efforts are currently underway to provide special medical training to these individuals so that they can give medical pre-arrival instructions for victims or families to follow until EMS arrives on the scene. Persons with this special training are called Emergency Medical Dispatchers (EMD). (3) Personnel and Equipment. This includes the ambulances, equipment on the ambulances and the staff (EMTs or Paramedics) which actually respond, treat and transport the patient. (4) Medical Control. This is medical oversight and direction provided to the field technicians (EMTs, Paramedics, etc.) by physicians. (5) Medical Facility. This is the facility that receives the patient being treated and transported by EMS. There are other aspects of a comprehensive EMS system including prevention, first responders, public education, specialty treatment centers, etc. Primary care providers should be familiar with their local system.

The EMS System, although comprehensive, has evolved addressing primarily adult injury and illness, due in part to the fact that pediatric emergencies comprise less than 12% of EMS calls in Georgia. Recently, however, the importance of proper emergency

care for children has been embraced by EMS and efforts are now underway to ensure that children also receive high quality emergency care. As a pediatric primary care provider, you are a critical resource in bringing this about.

Emergency Medical Services for Children

The Emergency Medical Services for Children system, as a part of the global EMS system, uses the same public access, the same dispatch, the same ambulances and equipment and the same personnel and facilities to respond to emergencies of children and adults. The specialized training, equipment and medical oversight necessary to appropriately address the needs of the pediatric patient are areas in which EMS needs your expertise to ensure proper response.

In a fully integrated EMS-C system, pre-hospital care includes Basic Life Support personnel such as first responders, EMTs and paramedics. First responders may be firefighters, police officers, or volunteers. Care is delivered on scene and advanced life support is delivered either through direct “on line” medical direction or through “off line” (indirect) medical direction. Indirect medical direction is comprised of triage and treatment protocols, training, system policies, and continuous quality improvement (CQI). Direct medical direction is provided by the real time communications between the field technician and a physician via radio or telephone.

Hospitals providing specialized trauma care are designated by the state as level I, II, III or IV trauma centers and are staffed and equipped to handle victims with moderate to severe injuries. The Georgia EMS-C program in collaboration with the Office of Trauma is active in reviewing criteria required in providing pediatric trauma care.

Emergency Medical Services for Children is a broad based, comprehensive effort to improve health care delivery to children who have become suddenly ill or injured. High quality care can be provided only through collaborative efforts of many health care professionals and child advocates, working through the whole spectrum of care from prevention to pre-hospital care through Emergency Department stabilization, critical care, and rehabilitation. As a primary care provider one way in which you play a critical role in this process is through educating parents and other care givers regarding recognition of pediatric emergencies. When should they call EMS and when should they call you? Should they take CPR or other training? These are important educational activities that you should undertake. You, as a primary care provider, may provide support to children and families once they enter the emergency system, and the myriad of subspecialists involved in the care of the multiple injured child. Once the acute phase of treatment has passed, primary care providers can coordinate rehabilitative care with the goals of returning the child to the level of activity that was normal before the emergency occurred.

Role of Primary Care Providers in EMS

Finally, it is important that your office, when it becomes the entrance point to the EMS system for a patient, is familiar with the EMS system in your region, and prepared to integrate quickly and efficiently into it.

To assist with the overall success of your local EMS system, you can work with the EMS system to develop appropriate protocols for the treatment of children in the pre-hospital setting. You can participate in the development and delivery of educational programs for EMS personnel. You should be an advocate for 911 if it does not exist in your area. You should help develop and/or support pediatric educational programs for both initial training and continuing education of EMS personnel.

Primary care providers are critical to the success of an EMS-C program. It is through your commitment and working with all the members of the EMS team that high quality emergency care for children will become a reality.

Section 4 – MOCK CODES IN THE OFFICE

Running Mock Codes in the Office

Purpose

Full pediatric cardiopulmonary arrest is, fortunately, an extremely rare occurrence in the primary care setting. Despite this fact, emergencies do occur in the office setting. In most cases these emergencies will be severe presentations of common pediatric diseases, including asthma, bronchiolitis, DKA, dehydration, head injury, poisoning or seizures. All of these disorders can become life-threatening if not managed appropriately and swiftly in the office.

In an emergency the ABCs must be addressed immediately. The sooner basic and advance life support is initiated, the greater the chance for complete recovery. However, the knowledge and skills required at the time of an emergency are not those that the primary care provider uses often. The mock code is a relatively simple drill that can help the entire office develop confidence and proficiency at a rare, but extremely important time for a critically ill child.

Managing an office emergency requires much more than just the clinical expertise to treat a severe or unusual disease. Communication and organization among the entire office staff are vital for a good outcome for the patient. Mock codes are tools to assist the entire office team develop these skills.

The mock code presented in this course is meant to represent “a typical scenario” that could occur in any office or clinic setting. The equipment used and the number of people who participate will vary depending on the location and style of your practice. The purpose is to represent priorities and overall techniques during an office emergency. It is NOT to demonstrate what equipment or medications should be in all offices as that will vary depending on your practice.

Overall Goal

The goal of this section is not just to demonstrate how a mock code could be done in your office, but also to give you both suggestions and tools to help you organize them on your own as well as the initiative to continue to do them in the future. Only in this way can your staff maintain the readiness to handle rare pediatric emergencies.

The instructor of the course will leave you additional materials (code charting form, drug references for code medications and evaluation tools) you may use in your office during mock or real emergencies.

Goals for Individual Staff Members

1. Receptionist, secretary or other office staff who see the patient initially can identify signs and symptoms of an impending emergency (“Red Flags”): Respiratory Distress, Cyanosis, Seizures, Altered Mental Status, etc.
2. Office nurse, physician or both will review equipment needs, organize equipment, and familiarize staff with its location and proper use.
3. Providers will familiarize staff with local EMS, including proper access and capabilities.
4. Providers are familiar with medications used in cardiopulmonary emergencies.
5. Equipment and supplies are organized in a resuscitation room or code box.
6. Receptionist, nurse or other office staff will document during resuscitation.
7. Providers will maintain current resuscitation skills and request the same of the staff.

Suggestions for Organizing Office Based Mock Codes

1. Schedule them on a regular interval (monthly, quarterly) when all the staff is able to participate.
2. Involve all members of the office – Physicians, Nurses, Secretaries, Clerks, Nurse Practitioners, Physician assistants, etc. It may be possible to include EMS if they are invited to participate.
3. Choose scenarios that relate to severe presentations of relatively common problems: severe wheezing, dehydration, meningitis, head injury, DKA, etc.
4. Evaluate the code afterward to identify your strengths and weaknesses, and make changes in your office or organization to improve.
5. Develop a system to check equipment and medications at a regular interval to make sure stock is always present and not outdated.

During the Mock Code

1. Establish roles: Leader, Airway, Circulation, Recorder, a staff member that draws up medications and sets up equipment, another who repeatedly assesses the patient.
2. Try to mimic an actual emergency as much as possible. During the mock code pretend that the intervention has not happened until that therapy has been set up and “delivered”. In other words – the IV isn’t considered started until someone has found the appropriate sized catheter and handed it to the individual attempting access. Providers will be better prepared if they have had actual practice in finding the medications and drawing them up. This may become “expensive” if all equipment and medications are open and have to be discarded afterward. There is certainly no need to open intraosseous needles and the like; however, it is useful to develop actual skill in drawing up medications. It may be useful to develop actual skill in drawing up medications. It may be useful to label saline vials as Epinephrine or Atropine, etc. In some cases the local hospital or EMS may be able to supply outdated medication for practice.

3. Allow 15 minutes to “run” the code.
4. Have a moderator (preferably not involved in running the code) supply information when requested; therefore, those running the code will not be certain of the outcome of their interventions until they are completed!

To Observe during the Demonstration

Clinical

- _____ Were the ABC’s assessed rapidly at the onset of the emergency, then reassessed at frequent intervals during the resuscitation.
- _____ If IV access was not established within 90 seconds, did the team move rapidly to intraosseous access.
- _____ Once the ABC’s were assessed, did the examiner complete a systematic evaluation of the patient.
- _____ When interventions were unsuccessful, did the team move rapidly to another intervention.
- _____ Was the patient stabilized before transfer, or was the “scoop and run” principle utilized.
- _____ Did office practitioners utilize services that EMS can provide, including equipment and skills.

Organizational

- _____ Was EMS system activated promptly.
- _____ Was communication directed and clear between all members of the “code team”.
- _____ Were roles clearly assigned by the code leader.
- _____ Were all members of the code team free to make suggestions on the patient’s behalf.
- _____ Did anyone speak to the family during the code.
- _____ Did someone record the events during the code.

Sample Scenarios

DKA

10 year old with new onset previously undiagnosed DKA. Polyuria and polydypsia for a week. Today lethargic and confused. Glucose 1200.

Sepsis

2 year old with meningococccemia. Found this morning with rash and almost completely unresponsive. Had URI yesterday otherwise fine.

Asthma

8 year old with asthma. Has been wheezing for days with URI, but very severe this evening. Told mom before he had been taken to the office that he had been giving himself puffs of his inhaler every half hour most of the day.

Head Trauma

6 year old with concussion and possibly more. Was playing soccer and collided with another child. The child was “out” for 2-3 minutes, then woke up and was groggy but oriented. Vomited once on the way to your office.

Seizures

1 year old with a complex febrile seizure. Pulling at her ears and found to have a temp of 104. Mom gave her a bath to cool her off and she began to have a generalized seizure several minutes later. Her parents rushed her to the office while carrying her on their laps, and now the seizure has persisted for over 20 minutes.

Stridor

2 year old with possible epiglottitis. Woke up early this morning with very loud breathing and a barking cough. Feels very hot to touch, has been drooling and for past 30 minutes has appeared nervous and tired.

Anaphylaxis

5 year old boy who was stung by a bee while playing outside. Mom notes that his eyes and lips swelled within minutes and she brought him to the doctor when he subsequently developed wheezing.

Section 5 – PROTOCOLS

Protocols for Office Emergencies

The following section contains treatment protocols for pediatric office emergencies. The first section contains guidelines for cardiopulmonary resuscitation and emergency cardiac care. The guidelines cover both basic life support for the pediatric patient and medication algorithms for cardiovascular emergencies: asystole, bradycardia, ventricular tachycardia and ventricular fibrillation.

As discussed previously, most office emergencies do not involve complete cardiopulmonary arrest, but severe presentations of common pediatric problems. Parents may not recognize the severity of an illness or the potential for deterioration, and take the child to the primary care office rather than the emergency department. Early intervention by the primary care provider in these situations can truly make the difference between a good and bad outcome.

With this in mind, protocols for treatment of severe presentations of common pediatric emergencies are presented here. They cover the range of moderate to severe degrees of illness. Some therapies may be very familiar while others are more obscure, and typically rendered in the pediatric emergency department or the intensive care unit.

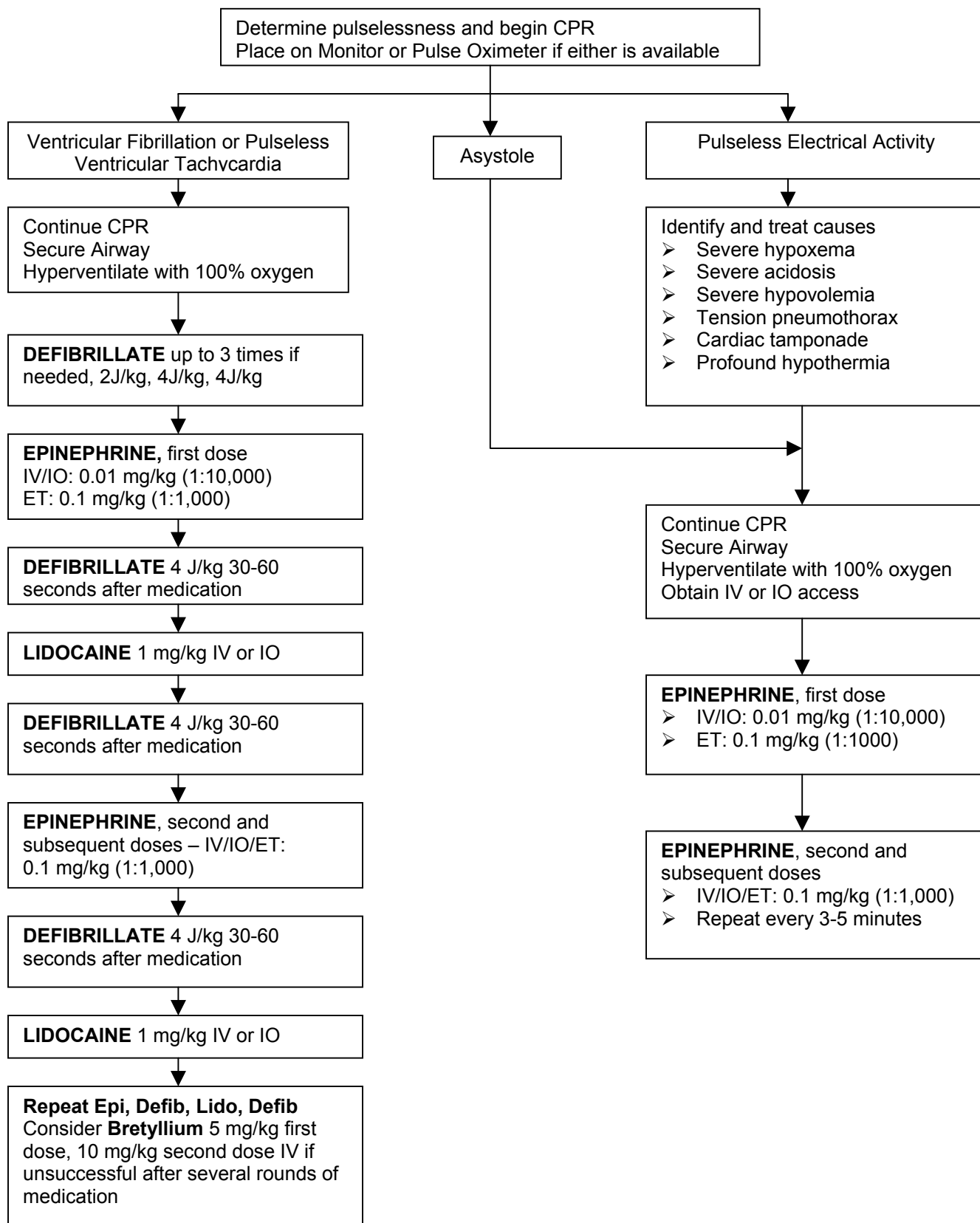
It is not expected that the primary care provider will have all of the suggested equipment or therapeutic agents at his/her disposal in the office. Sometimes the local EMS unit can supply necessary equipment or agents for stabilization. In other situations, such as an office located adjacent to an emergency department, equipment and therapeutic agents are readily available within minutes and thus are not required in the office itself.

It is hopeful that this section may be very quickly reviewed prior to organizing and running a mock code, or even used as a rapid reference for that rare moment when a critically ill child presents to your office.

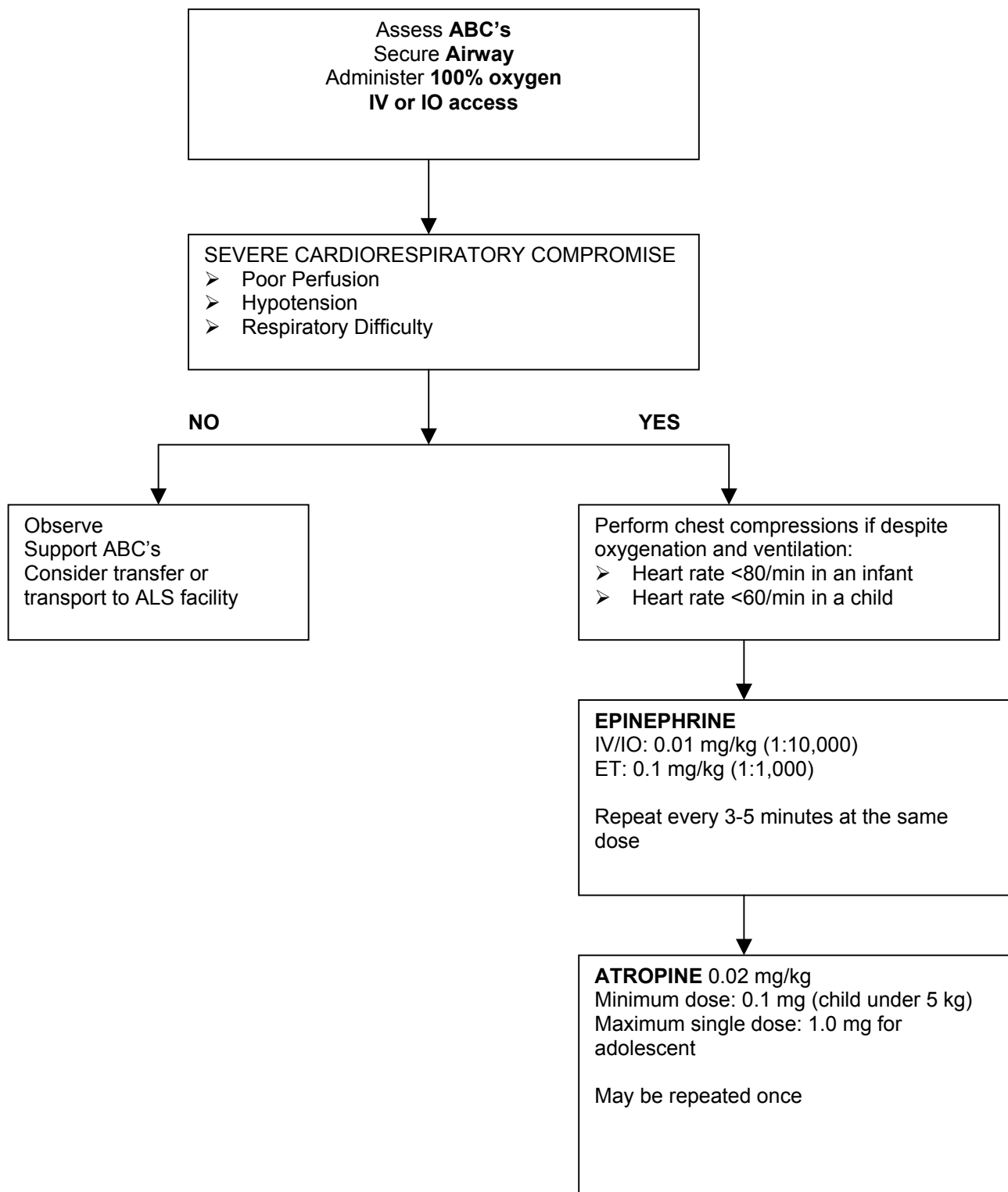
Cardiovascular Emergencies – Basic Life Support

MANEUVER	NEWBORN	INFANT LESS THAN 1 YEAR	CHILD 1 – 8 YEARS
AIRWAY	Extend neck; Shoulder padding	Head tilt-chin lift Unless trauma present	Head tilt-chin lift Unless trauma present
BREATHING Initial	May require 30-40 cm H ₂ O	2 breaths at 1-1.5 seconds/breath	2 breaths at 1-1.5 seconds/breath
Subsequent	40-60/min at lower pressure	20 breaths/min	20 breaths/min
CIRCULATION			
Pulse	Brachial	Brachial/femoral	Carotid
When to compress	<60 or <60-80 and not responsive to PPV	<80	<60
Depth of compression	1/3 to 1/2 depth of the thoracic cavity	1/2 depth of the thoracic cavity	1/2 depth of the thoracic cavity
Rate	120/minute	At least 100/minute	100/minute
Compression to ventilation ratio	3:1 (pause for ventilation)	5:1	5:1
Location	Mid Sternum	Lower 1/3 Sternum	Lower 1/3 Sternum
Technique	2 fingers or 2 thumbs encircling chest	2 or 3 fingers	Heel of one hand

Cardiovascular Emergencies – Cardiopulmonary Arrest



Cardiovascular Emergencies – Bradycardia



Cardiovascular Emergencies

Drug Delivery, Volume Administration and Vascular Access during Codes

Endotracheal Medication Delivery

Several drugs may be delivered via the endotracheal route; however, only epinephrine is used on a routine basis. The drug may be directly squirted into the opening of the endotracheal tube. Two to five mL of normal saline flush should be given immediately afterward. The patient must be bagged for several breaths prior to chest compressions being resumed or the drug and diluent may be ejected back out the endotracheal tube by the increase in intrathoracic pressure.

Intraosseous Placement and Medication Delivery

A standard intraosseous needle or spinal needle with stylet may be used. A needle with a stylet is preferred as it will prevent the needle from becoming occluded with bone on insertion. The needle should be placed about 1-2 cm below the tibial tuberosity on the medial surface of the tibia. The needle should be placed perfectly perpendicular to the skin surface. The instrument should be supported in such a fashion that control is maintained when the needle is forced through the cortex of the bone and into the marrow. The needle usually is able to stand on its own. The needle may be aspirated for marrow (a thick bloody material), but if none returns this does not mean the needle is not correctly placed. The needle should be flushed with 3-5 cc of saline. If no swelling under the skin is observed and no fluid leaks around the needle, the needle is correctly placed.

All medications delivered via the intraosseous route should be followed by 3cc of normal saline flush. All fluid should be administered in the form of boluses which are pushed through syringes; gravity will not provide sufficient force to allow fluid to drip from a bag.

Volume Administration

Fluid boluses are not included in pediatric asystole or bradycardia protocols as they have never demonstrated to provide significant benefit. However, many patients have poorly functioning myocardium after return of spontaneous circulation during a code and volume administration will often improve cardiac output afterward. Also, children with hypovolemic shock secondary to severe GI fluid loss or overwhelming infections may be difficult to resuscitate without additional volume to improve preload to the heart. Therefore, 20 cc/kg of saline may be administered to an asystolic or bradycardic patient if 2-3 doses of Epinephrine have not resulted in return of spontaneous circulation.

Cardiovascular Emergencies - Shock

Definition

Inadequate oxygen delivery to the tissues to meet their needs. May be caused by a number of different reasons. Does not necessarily imply hypotension. A child will often be in shock long before hypotension develops.

Etiologies

- ♥ Hypovolemic shock: Dehydration, blood loss
- ♥ Septic shock: Meningitis, Meningococcemia
- ♥ Circulatory Shock: Congenital heart disease, Myocarditis

Pathophysiology

The most common cause of shock in children is hypovolemia related to severe dehydration as a consequence of vomiting, diarrhea and inadequate enteral intake. This is more common in newborns and infants who not always rehydrated adequately orally. Septic shock is relatively rare in an otherwise healthy child; it is much more common in patients whose immune system is abnormal (AIDS, chemotherapy).

In both hypovolemic and septic shock the primary problem leading to tissue oxygen debt (shock!) is diminished intravascular volume resulting in decreased cardiac output. As cardiac output is the product of stroke volume (blood pumped with each beat) and heart rate, the body tries to compensate for the diminished stroke volume seen with hypovolemia by increasing the heart rate. The patient will then attempt to maintain blood pressure by increasing vascular resistance. Extremities will be cool, with diminished capillary refill; however, blood pressure may be completely normal (compensated shock). Only when hypovolemia becomes overwhelming do compensatory mechanisms fail and the blood pressure falls (decompensated shock).

Signs and Symptoms

	MILD (5%)	MODERATE (10%)	SEVERE (15%)
Behavior	Normal	Irritable	Irritable/Lethargic
Mucous membranes	Normal	Dry	Parched
Anterior fontanel	Flat	Variable	Sunken
Circulation	Normal	Tachycardia	Tachycardia, maybe hypotension
Urine	Slight increase in	Increase in	Oliguria, increase in

Treatment - Shock

1. AIRWAY & BREATHING	It is useless to support the circulation if the patient is not able to get oxygen into the lungs. Every patient in shock should be treated urgently with 100% oxygen.
2. CIRCULATION	Perform chest compressions if asystolic or bradycardiac.
3. VASCULAR ACCESS	Obtain vascular access as rapidly as possible. If patient is impending circulatory collapse or arrest, spend no more than 1 to 2 minutes attempting peripheral IVs. If unsuccessful in that time period and the patient is under 6 years old, place intraosseous needle for vascular access.
4. VOLUME	Administer 20 cc/kg of normal saline or lactated ringers as a volume bolus over several minutes.
5. REASSESS	Reassess the patient after each volume bolus.
6. VOLUME	Repeat 20 cc/kg fluid boluses until the patient demonstrates some signs of improving circulatory status (heart rate decreases, mental status improves, blood pressure normalizes). This may require 60 to 100 cc/kg in children with severe shock. Early aggressive volume resuscitation has been shown to reduce mortality in septic shock!
7. TREAT UNDERLYING CAUSE	Treat underlying cause of shock if able: Broad spectrum antibiotics infection suspected.
8. NO INOTROPES	Inotropic support may be necessary in severe cases of shock, but should not be used until intravascular volume is restored and adequate monitoring can be done. There is no role for this treatment in the office setting.
9. VOLUME OVERLOAD?	Do not worry about "volume overload" in unusual cases of cardiogenic shock, such as myocarditis. Volume support is always indicated in the initial therapy and rarely results in clinical deterioration. In cases of septic shock, volume administration may lead to pulmonary edema and respiratory deterioration. This does NOT mean too much fluid was administered; often it is an unfortunate but expected finding in the course of the disease process.

Cardiovascular Emergencies - Anaphylaxis

Definition

An acute, often explosive, system reaction characterized by urticaria, respiratory distress, and vascular collapse. It occurs in a previously sensitized person when exposed to the sensitizing antigen.

Urticaria: local wheals and erythema in the dermis.

Angioedema: a similar eruption, but with larger edemaous areas that involve subcutaneous structures as well as the dermis.

Acute urticaria and angioedema are essentially anaphylaxis limited to the skin and subcutaneous tissues.

Etiologies

Exposure to any number of potential antigens. Most common causes are foreign blood products, certain drugs, desensitizing injections and insect stings.

Food allergies (from eggs, shellfish, nuts or fruits) typically result in urticaria or angioedema, but may be severe and lead to anaphylaxis in certain individuals after exposure to even very small amounts.

Pathophysiology

A Type I allergic reaction that occurs when the antigen reaches the circulation. Histamine and other vasoactive substances are released when the antigen reacts with IgE on basophils and mast cells. These substances cause smooth muscle contraction and vascular dilatation.

Signs and Symptoms

Typically in 1 to 15 minutes the patient complains of a sense of uneasiness and may become agitated and flushed. Older children may complain of palpitation, pruritus and difficulty breathing. An urticarial rash may quickly appear. The patient's face, eyes and tongue may rapidly swell. Stridor and/or wheezing may also quickly become audible and severe.

The symptoms may develop over minutes to hours or, if very severe, may progress to respiratory and/or circulatory failure very rapidly.

Treatment – Severe Anaphylaxis

1. BASIC AND ADVANCED LIFE SUPPORT	Always begin here if necessary.
2. EPINEPHRINE	<p>NO IV PRESENT: 0.01 cc/kg subcutaneously of 1:1,000 Epinephrine. Administer as rapidly as possible as this therapy more than any other reverses all effects of anaphylaxis and should be effective almost immediately. Should always be used in any respiratory or circulatory abnormalities.</p> <p>If IV present and severe respiratory symptoms or circulatory collapse, 0.1 cc/kg of 1:10,000 Epinephrine</p>
3. VOLUME	If IV present, 20 cc/kg of lactated Ringers or normal saline.

Treatment – Mild to Moderate: Urticaria and/or Angioedema

1. EPINEPHRINE	0.01 cc/kg of 1:1,000 Epinephrine subcutaneously
2. BENADRYL	1 mg/kg IV or IM
3. STEROID	Methylprednisolone (Solu-Medrol®) 1-2 mg/kg IV or Decadron 1 mg/kg IM

Respiratory Emergencies - Intubation

Introduction

The following is a description of one method to approach the intubation of a child. As with many other manual skills in medicine, it is difficult to develop and maintain skill at this procedure without practice. These descriptive instructions are provided only to suggest techniques that may be helpful in improving pediatric intubation practices. Always remember that almost all children who will require intubation may be bag-mask ventilated for extended periods of time quite successfully and this alone can be life saving!

1. POSITIONING	Stand above the head of the supine patient. A roll may be placed under the patient's shoulders. The patient's head is slightly hyperextended.
2. CPR	Chest compressions are stopped just prior to laryngoscopy.
3. LARYNGOSCOPE	Open the laryngoscope blade and place it in your left hand
4. OPEN MOUTH	The patient's mouth is opened as wide as possible with your right hand (either with a scissors motion with the thumb on the lower teeth and the first finger on the upper teeth or with the right hand depressing the mandible alone.
5. LARYNGOSCOPY	<p>The laryngoscope is placed in the right side of the patients mouth to approximately 4/5 of its length.</p> <p>The tongue is swept to the left as the laryngoscope blade is moved midline.</p> <p>The laryngoscope handle is lifted along the long axis of the laryngoscope handle (at a 45 degree angle from the patient). Avoid resting the laryngoscope on the upper gums or teeth as may occur when the handle is pulled back to life up the tip of the blade.</p> <p>Visualize the area beyond the base of the tongue. Many operators who are used to intubating newborns do not place the laryngoscope blade in far enough initially. If the laryngoscope is appropriately positioned either the larynx (opening to the trachea) or pharynx (opening to the esophagus) is visualized. It is almost impossible in an infant or small child to place the laryngoscope in exactly the correct position on initial entry. It may also be very difficult to differentiate between the entrance to the trachea or to the esophagus upon direct visualization.</p>

Respiratory Emergencies – Intubation

6. SUCTION	Suction out the oral cavity if necessary to improve visualization.
7. CONFIRM VISUALIZATION OF THE LARYNX	At this point you should have either the larynx or pharynx in view. If you are confident that the larynx is in view (vocal cords are clearly seen), intubate the child. If at all uncertain, slowly withdraw the laryngoscope blade until either the epiglottis is in view or another “hole” is viewed. If the epiglottis flips into view, the larynx (airway) is just below. If another “hole” is visualized, this will be the larynx and the first hole viewed the pharynx.
8. INTUBATION	The tube is placed into the mouth at the rightmost corner of the lips. The tube is gently guided into the larynx. The tube should not be placed under the curvature of the laryngoscope blade as this will obstruct the view of the larynx. The larynx should be visible until the tube is passed beyond the entrance (vocal cords may occasionally be seen).
9. POSITION TUBE	The tip of the endotracheal tube should be placed about 1-2 cms below the level of the vocal cords. Confirm proper placement by listening for breath sounds in the lateral most regions of the left and right lung fields and subsequently by chest x-ray

Respiratory Emergencies – Foreign Body

How you choose to remove an airway obstruction depends on the age of the child. For the child older than 1 year, the abdominal thrust is recommended; for the younger child, back blows followed by chest thrusts are the maneuvers of choice.

Over 1 year

The abdominal thrust, or Heimlich maneuver, is recommended for relieving airway obstructions in children older than 1 year. It can be performed with the child standing, sitting or lying down. When the child is conscious, the thrusts can be delivered in any of these three positions. When the child is unconscious, deliver the thrust while he or she is supine.

Conscious – Standing or Sitting

1. ENCIRCLE CHEST	Stand behind the child, arms directly under the armpits, and encircle the chest.
2. HAND PLACEMENT	Place the thumb side of one fist against the middle of the child's abdomen, slightly above the navel and well below the xiphoid.
2. UPWARD HAND THRUSTS	Grasp the fist with the other hand and exert five quick upward thrusts. The fist should not touch the xiphoid or lower margins of the rib cage, because force applied to these structures may damage internal organs.
4. COMPLETE 5 THRUSTS	Deliver each thrust in a separate, distinct movement. Continue the thrusts until the foreign body is expelled OR five thrusts are completed. If the child loses consciousness, use the following instructions with the child lying down.

Unconscious – Lying Down

1. PLACE SUPINE	Place the child supine. Kneel close to the child's side or straddle the hips while facing the child's head.
2. JAW THRUST	Use a chin lift or jaw thrust to open the victim's airway.
3. HAND PLACEMENT	Place the heel of one hand in the middle of the child's abdomen, slightly above the navel and well below the rib cage and the end of the xiphoid. Place the other hand on top of the first.
4. UPWARD THRUST	Press both hands into the abdomen with a quick upward thrust. If necessary, perform up to five separate and distinct thrusts. Direct each thrust straight upward towards the child's head, not to either side of the abdomen.
5. CHECK MOUTH AND REPEAT THRUSTS	After five abdominal thrusts, check mouth for foreign body. DO NOT blind sweep. Try ventilating the patient. If the airway remains obstructed, go back to step 1 and repeat the process.

Respiratory Emergencies – Foreign Body

Under 1 Year

Back blows followed by chest thrusts are recommended for relieving airway obstructions in infants younger than 1 year.

1. POSITION INFANT	Hold the infant face down, resting on your forearm. Support the infant's head by firmly holding the jaw. Rest your forearm on your thigh to support the infant; the victim's head should be lower than the trunk.
2. BACK BLOWS	Forcefully deliver five back blows between the infant's shoulder blades, using the heel of the hand.
3. REPOSITION INFANT	After delivering the back blows, place your free hand on the infant's back, hold the head so that the infant is sandwiched between your two hand. One hand supports the neck, jaw, and chest, while the other rests on the back.
4. TURN THE INFANT	Turn the infant, supporting the head and neck carefully, and position the victim face up across your thigh. The infant's head should remain lower than the trunk.
5. CHEST THRUSTS	Make five quick downward chest thrusts in the lower half of the chest, approximately one finger's width below the nipple line. These thrusts are similar to external chest compressions used during CPR, but are performed at a slower rate. Check mouth for foreign body. DO NOT blind sweep. Ventilate into the infant's mouth. If the airway remains obstructed, go back to step 1 and repeat the process.

Respiratory Emergencies – Croup (Laryngotracheobronchitis)

Pathophysiology

Infectious croup is typically caused by a viral upper respiratory infection causing erythema and edema of the subglottic region. The vocal cords are often edematous, with impaired mobility. Hypoxemia develops when upper airway obstruction becomes severe and results in decreased alveolar ventilation. As croup is usually associated with a viral infection, other signs of infections are often present-including low grade fever and congestion. In contrast, spasmodic croup is not usually associated with an infection. It occurs at night with sudden onset of dyspnea, barking cough, and stridor in a previously healthy child. It often recurs on 3-4 consecutive nights.

Etiology and Epidemiology

- ♥ Parainfluenza type I, III; Adenovirus, RSV, Influenza A
- ♥ Patients aged 6-36 months, seen in late fall and early winter

Diagnosis

- ♥ 1-2 days of prodromal URI, followed by hoarse voice, barking cough, stridor, often begins at night, typically have a mild fever.
- ♥ If severe: retractions, delayed air entry, hypoxia.
- ♥ AP neck soft tissue radiograph: Subglottic edema (“steeple sign”) (rarely necessary as diagnosis usually may be made clinically and only to “rule-out” other diagnosis).
- ♥ In all cases of stridor it is important to consider and “rule-out” epiglottitis, which is always a life-threatening emergency. These patients are almost always toxic in appearance with a relatively high fever and have had sudden onset of symptoms.

Treatment – Moderate to Severe

1. HUMIDIFIED OXYGEN	Moistens and humidifies the airway
2. NEBULIZED EPINEPHRINE	2.5cc of standard 1:1,000 IV epinephrine added to 2.5cc of normal saline in the nebulizer.
3. STEROIDS	Decadron 0.5 to 1.0 mg/kg IV or IM
4. RESPIRATORY FAILURE	Proceed to manage as with any form of respiratory failure. ABC's. Even though airway obstruction may be severe, most patients can be adequately bag-valve-mask ventilated. If intubation is necessary, may need to choose an endotracheal tube that is smaller by 0.5 to 1.0 mm than would normally be used for that aged patient.

Respiratory Emergencies – Epiglottitis

Pathophysiology

Supraglottic and epiglottic cellulitis with massive edema resulting in sore throat, dysphagia, and muffled stridor due to decreased air flow. Total airway obstruction may occur and be life-threatening because of the difficulty placing an endotracheal tube through a swollen and closed larynx.

Etiology

H. influenza type B (by far the most common cause, but substantially decreased in incidence since the advent of the H flu vaccine), S. pneumoniae, S. aureus, group A and C beta-hemolytic streptococci. Seen increasingly in teen and adult due to H. Flu vaccine given to young children.

Diagnosis

Acute onset fever (usually quite high), sore throat, drooling, rapidly progressing to respiratory distress. Child appears anxious, toxic, air hungry, tachycardic.

Radiography: Lateral neck view thumb-like epiglottitis, thickened aryepiglottic folds. Differential: croup, omega epiglottitis, normal variant, thermal/caustic injury, angioedema, lymphoma, histiocytosis, hemorrhage, and direct trauma.

Treatment

Epiglottitis always represents a life-threatening medical emergency because of the risk of sudden upper airway obstruction. It is impossible to know when or if this obstruction will occur; therefore, the airway must be protected with an endotracheal tube once the diagnosis has been made (or even highly suspected).

1. TRANSPORT	Immediately transport to the nearest emergency facility (911) and call ahead to notify them of this patients impending arrival.
2. CONTROLLED AIRWAY VISUALIZATION	Arrange for direct airway visualization under controlled conditions (usually in the operating room). This involves mobilization of both anesthesia and ENT surgery.
3. IF RESPIRATORY FAILURE	If complete airway obstruction occurs en route or in the office, begin basic life support. Despite the severity of the airway obstruction, bag-valve-mask ventilation is almost always still effective. Emergency tracheostomy should be planned for, but rarely required.

Respiratory Emergencies – Wheezing: Status Asthmaticus/Bronchiolitis

Pathophysiology

Narrowing of the mid to small airways resulting in difficulty with exhalation. During inspiration negative intrathoracic pressure “pulls” the small airways open. During exhalation the positive intrathoracic pressure tends to compress the already narrowed airways. This leads to air-trapping in the lungs and dead space (area of lung that is filled with gas but does not exchange with fresh air with each breath). Dead space results in ventilation/perfusion mismatch and hypoxia. In the most severe cases hypercarbia and respiratory failure may develop.

Airway narrowing is caused by a combination of mucus plugging, airway wall edema and smooth muscle bronchial wall constriction. Treatment, therefore, is aimed at reversing all these processes.

Etiology

Asthma implies an inherent abnormality of the airway. Asthma may be triggered by the following: allergies, cold air, exercise, environmental irritants (smoke), and most commonly, viral upper and lower respiratory tract infections of almost any etiology.

Bronchiolitis, by definition, implies an infection of the bronchioles. The most common cause is RSV; however, many other viral agents may cause it as well.

Differentiation

Because Asthma typically implies some degree of bronchoconstriction, the term is usually reserved for children over 1 year of age (as they have developed smooth muscle in the walls of the small airways) or for those who have had multiple bouts of wheezing. Bronchiolitis usually refers to viral URI's associated with wheezing (in children under one year of age).

The distinction is often blurred between these two processes as Asthma is commonly triggered by viral infections (even RSV) and many patients who have bronchiolitis clearly respond to bronchodilators indicating smooth muscle development in their small airways.

Therefore, treatment for the two processes is very much the same. This is especially true when the wheezing is severe.

Respiratory Emergencies – Wheezing: Status Asthmaticus/Bronchiolitis**Treatment for Severe Wheezing**

1. ABC'S	ABC's, as always, first and foremost.
2. OXYGEN	Administer 100% oxygen.
3. ALBUTEROL NEBULIZED	Albuterol 2.5 mg (for children <15 kg or 5 mg for children >15 kg) diluted in 2 cc of normal saline. Repeat every 10 to 20 minutes (may give back to back if very severe wheezing; limited only is HR >180-200).
4. STEROIDS	Solu-Medrol® 2 mg/kg IV bolus or Decadron® 1 mg/kg IM if no IV
5. IPATROPIUM NEBULIZED OR ATROPINE NEBULIZED	Atrovent® (Ipratropium) 250 mcg in 2.5 cc saline nebulized (500 mcg if >10). Useful if mixed with Albuterol nebulizer. Atropine (if Ipratropium not available) 0.03-0.05 mg/kg nebulized. (use 0.4 mg/cc = IV form of Atropine; add normal saline to nebulizer to make a total volume of 3 cc.

Pending Respiratory Failure

1. PICU REFERRAL	Consult with medical expert; call EMS as soon as possible to transfer to nearby Emergency Department.
2. CONTINUOUS ALBUTEROL	Continuous Albuterol nebulization – 0.3 mg/kg/hr or give albuterol nebs back to back, etc.
3. RESPIRATORY FAILURE	ABC's as always with basic and advance life support.

Neurologic Emergencies – Status Epilepticus (Generalized Tonic-Clonic Seizures)

Definition

Continuous seizure activity, or intermittent seizure activity without recovery of consciousness between seizures, that lasts for more than 30 minutes.

Pathophysiology

Abnormal cortical electrical discharge emanating from an abnormal focus in the brain which in turn spreads across the entire cortex resulting in loss of consciousness and generalized tonic-clonic motor activity.

Most common causes in children:

- ♥ Febrile illness in patients 1 to 5 years old (approximately 25%)
- ♥ Idiopathic seizure disorder (first presentation of epilepsy) (approximately 25%)
- ♥ Head trauma with possible increased intracranial pressure and/or hemorrhage
- ♥ Hyponatremia in children under 6 months of age who receive too much free water
- ♥ Hypoglycemia
- ♥ Intracranial infections: Encephalitis more common cause than bacterial meningitis (which rarely presents with seizures)
- ♥ Calcium and magnesium abnormalities are extraordinarily rare

Patients are typically unresponsive; the motor activity is almost rhythmic and can not be stopped by holding an extremity.

The seizure itself is rarely detrimental to the patient; theoretically, the brain will eventually develop nutritional deprivation and become permanently injured after 45 minutes to 1 hour of absolute, continuous seizure activity. This is an extremely rare occurrence and typically only occurs when patients have prolonged seizures related to underlying problems such as trauma and infection. These problems, in and of themselves, may lead to neurologic damage with sequelae and the seizures may be very difficult to control with anti-epileptic medication.

Airway and breathing often appear to be compromised as breathing is noisy and irregular, and the patient may appear dusky. Respiratory failure or severe hypoxia are rarely caused by the seizure itself. Respiratory failure occurs much more commonly secondary to the treatment of the seizure.

Goals of Therapy

- ♥ Prevent complications from extraordinarily prolonged seizures.
- ♥ Prevent secondary complications from the cause of the seizure (i.e. prolonged hypoglycemia).
- ♥ Prevent complications from side effects of the treatment of status epilepticus.

Neurologic Emergencies – Status Epilepticus (Generalized Tonic-Clonic Seizures)**Treatment**

1. ABC'S	Rapidly assess and manage airway, breathing and circulation. As stated previously, the airway is often intermittently obstructed and the breathing irregular. The patient is often mottled and cool. Usually no intensive airway or circulatory support is necessary unless apnea or severe shock is present.
2. INCREASED ICP	If increased intracranial pressure is suspected (intracranial hemorrhage, tumor, head trauma), treat immediately by intubation and hyperventilation. Call EMS immediately and consult trauma center or pediatric intensivist.
3. OXYGEN	Apply oxygen via face mask or nasal cannula. Pulse oximeters often work poorly in patients in status epilepticus. A blood gas is practically useless as it most certainly will demonstrate metabolic acidosis and/or mild hypercarbia, which usually require no treatment.
4. PREVENT INJURY	Prevent patients from harming themselves. Never place any objects in the mouth or nose.
5. EMS	Notify EMS as soon as possible.
6. DETERMINE CAUSE	Rapid test for common cause of status epilepticus: <ul style="list-style-type: none"> - Temperature - Accucheck if hypoglycemia suspected - Sodium if hyponatremia suspected
7. ESTIMATE DURATION	Estimate duration that the patient has been in status epilepticus.
8. DRUG THERAPY NECESSARY	If seizure has lasted longer than 10 to 15 minutes, treat immediately.
9. ATTEMPT IV IV SUCCESSFUL IV UNSUCCESSFUL	<p>Lorazepam (Ativan®): 0.1 mg/kg IV push or Phenobarbital 10 mg/kg IV slow push.</p> <p>Diazepam (Valium®) 0.1 mg/kg IV (has greater association with respiratory depression than Ativan®)</p> <p>Valium® 0.5 mg/kg rectally up to 20 mg.</p>

Neurologic Emergencies – Diabetic Ketoacidosis (DKA)

Pathophysiology

Relative insulin deficiency with counter regulatory hormone (epinephrine, cortisol) overproduction in an effort to increase serum glucose that results in:

- ♥ Ketoacidosis from cellular breakdown of fat rather than glucose for fuel
- ♥ Osmotic diuresis with hypovolemia and lactic acidosis from poor perfusion
- ♥ When glomerular filtration rate falls because of hypovolemia serum glucose rises rapidly with development of an even greater hyperosmolar state
- ♥ Brain develops “idiogenic osmols” (at least theoretically) to equilibrate with serum osmolality and prevent brain shrinkage

Goal of Therapy

Replace fluid deficit, correct hyperglycemia and hyperosmolality, maintain serum electrolytes within normal values, and correct ketoacidosis all without causing secondary injury to the patient.

Complications of Treatment

Elevated intracranial pressure. Etiology is uncertain but may be associated with rapid shifts in water into the brain when fluid deficits are corrected.

Electrolyte abnormalities:

- ♥ Hyponatremia
- ♥ Potassium – initially may be high due to acidosis, but quickly falls to low levels when acidosis is corrected.
- ♥ Phosphate – low, but is almost never a clinical problem.

Neurologic Emergencies – Diabetic Ketoacidosis (DKA)**Treatment**

1. ASSESS	ABC's, Neurologic evaluation
2. COMA?	If severely neurologically depressed (GCS less than 8), consult with pediatric intensivist and consider rapid transfer to a tertiary center. DO NOT BOLUS WITH INSULIN OR FLUID.
3. SHOCK?	Significant dehydration is common, severe shock is rare. If hypotensive or in profound circulatory failure, resuscitate until circulation is stable.
4. EMS	Notify EMS for transfer to emergency department as soon as possible.
5. LABS	Lab studies (those of which are available in the office): <ul style="list-style-type: none"> - Accucheck - Urine (dip for glucose, ketones, blood, protein) - Electrolytes, CBC, Serum ketones, Serum osmolality, pH (venous and arterial)
6. IV	Place peripheral IV.
7. VOLUME	Administer 10 cc/kg of normal saline over 30 minutes to 1 hour (20 cc/kg or more only if circulatory failure or severe shock).
8. INSULIN	No insulin is necessary for 1 to 2 hours after first fluid bolus is administered; therefore, it is not necessary to administer insulin in the office if transfer is eminent. If transport is delayed or there is a long transport time before arrival at a hospital, begin regular insulin at 0.1 units/kg/hour via continuous infusion if possible. An insulin bolus is almost never necessary as this may result in serum glucose falling rapidly and in turn predispose the patient to worsening cerebral edema. If the office is not able to prepare an insulin infusion and two hours have passed since fluid was given, administer 0.1 unit/kg of insulin IV bolus. Follow glucose levels closely afterward. Subcutaneous insulin will be irregularly absorbed as the patient's perfusion changes and may result in unpredictable changes in serum glucose.
9. VOLUME REPLACEMENT	Continue fluid administration at maintenance fluids for age plus replace total fluid deficit (usually 10% body weight) with normal saline evenly over 48 hours. This typically works out to close to 1.5 times maintenance fluid administration composed of 2/3 normal saline. May administer normal saline if this fluid is not readily available. Add potassium to the IV fluid only when the serum potassium is known. Add dextrose to the IV fluid when the serum glucose falls to less than 250-300 mg/dL.
10. REPEAT ACCUCHECKS	Follow Accucheck hourly as goal is to decrease serum glucose 50-100 mg/dL/hr. If the patient remains under your care for an extended period of time, remember to repeat glucose to determine effects of therapy.
11. DETERIORATES	If at anytime during treatment, neurologic condition deteriorates profoundly, consider treatment for malignant increased intracranial pressure (intubation, hyperventilation and mannitol).

Trauma – Closed Head Injury

Pathophysiology

Head trauma is extremely common among children. Most head trauma in children is minor resulting in no severe damage to the brain itself. However, an occasion, head trauma that at first appears to be benign, may result in severe intracranial injury.

In general, the degree of brain injury from head trauma relates to the force of the blow to the skull. For example, motor vehicle accidents at high speeds are much more likely to result in severe injury than are minor falls. Nevertheless, some minor injuries do result in slowly expanding intracranial hemorrhage or brain swelling.

In most cases of severe traumatic brain injury, either intracranial hemorrhage or brain swelling results in elevated intracranial pressure with resultant dangerously low cerebral blood supply to healthy areas of the brain. In these cases the patient almost always has either focal neurologic signs or moderate to severe depression of consciousness from the increased intracranial pressure.

Assessment

ABC's first, as always

Rapid neurologic exam comprised of the following:

- ♥ Level of consciousness: assessed by Glasgow Coma Scale which takes into account response to pain, vocalization and eye opening.
- ♥ Brain stem reflexes: cough, gag, pupillary response to light, corneal reflexes.
- ♥ Complete neurologic exam to check for any focal abnormalities in motor strength, sensory exam and coordination.

Who Needs a Head CT

Ideally, anyone with significant intracranial pathology (hemorrhage) would theoretically be better off to have it "discovered" despite the fact that it may not really merit any further medical care (i.e. neurosurgery). Unfortunately there is no sign or symptom that is associated with 100% accuracy in predicting who will have a positive finding on a head CT. The following data are from a study published in 1987 of 98 children with closed head injury (GCS = Glasgow Coma Scale).

- ♥ GCS of 12 or less, altered consciousness on admission, loss of consciousness for five minutes or more, unequal pupils, blood in the external auditory canal or behind the tympanic membrane and focal abnormalities on neurologic exam are each significantly associated with abnormal findings on CT.
- ♥ The presence of vomiting or seizures was NOT more likely to be associated with abnormal CT findings.
- ♥ All patients with posturing had abnormal CT findings.
- ♥ No clinical findings, alone or in combination, accurately identified all patients with abnormal findings on CT.

Trauma – Closed Head Injury

Who Should Be Admitted (Who's at Risk for Deteriorating)

In a study (1995) of 400 children with head injury, GCS 13-15, and normal head CT who were discharged to home, only 4 children required re-admission for neurologic causes. The only patient who required neurosurgical treatment was on an anti-coagulant.

Similar findings have been found in even larger studies of adults. In other words, if the head CT is normal and the child is neurologically normal other than very mildly abnormal level of consciousness, the patient may in almost all cases be safely treated as an outpatient.

Treatment of Elevated Intracranial Pressure

1. ABC'S	As always evaluate and treat first. Hypoxia or hypotension are both extraordinarily detrimental to any patient with increased intracranial pressure.
2. EMS	Call for EMS as soon as possible.
3. HERNIATION?	Hyperventilation – usually 30-40 breaths each minute is sufficient (via endotracheal tube if possible) Mannitol 0.5 grams/kg IV bolus

SECTION 6 – Teaching Families – Emergencies at Home

Recognizing, Managing and Preventing Emergencies at Home

Introduction

Primary care providers have many roles in EMS-C. In addition to providing emergency care when needed. A primary provider can also serve as a child advocate, coordinator of care, and educator. Providers can teach children and families how to recognize emergencies, how to respond to them appropriately, and how to prevent them from happening.

Recognizing Emergencies at Home

It is essential that parents can recognize a true pediatric emergency. Fortunately, infants and children are not likely to suddenly become seriously ill. Usually, children give parents some early warning that they are ill. The time of the day that the child is experiencing an emergency may dictate where the child goes or medical care. True emergencies that need to be treated in the emergency department at any time include:

- ♥ Uncontrolled bleeding
- ♥ Labored breathing
- ♥ Cyanosis
- ♥ Convulsions/seizures
- ♥ Stupor/coma
- ♥ Head injury with transitory loss of consciousness or persistent confusion
- ♥ Ingestion of a known poison
- ♥ Major dental injury (displaced tooth)
- ♥ Obvious broken bones
- ♥ Fresh burns that blister and ooze clear fluid

Accessing EMS

Easy access to the EMS system is essential and can be facilitated with the universal emergency access number 911. It draws on computerized data bases to automatically identify the telephone number and location of the caller. This enables the EMS system to route the calls to appropriate facilities that will send assistance even if callers cannot communicate due to their conditions, language barriers, or other reasons. If the area is not serviced by 911, parents should know the number of a nearby ambulance service or county Emergency Medical Service (EMS). Parents need to know about the emergency care that is available for children in their community. Questions that primary care providers should be able to answer for parents are:

- ♥ Do ambulances in the community have equipment and supplies for children?
- ♥ Are paramedics and EMTs properly trained to take care of children?
- ♥ Is the local hospital prepared to take care of pediatric emergencies?
- ♥ Are the most severely ill and injured children taken to specialized centers?

Emergencies at Home

True Emergencies

Health care professionals train for years to distinguish between emergent and non-emergent situations. We must be mindful of the layperson who may have problems judging the severity of an illness or injury. It is important to remember that it is better for parents to err on the side of over-reacting to the injury or illness rather than waiting until the child is critically ill. Emphasizing marked changes in behavior (lethargy, hyperactivity) rather than associated symptoms (cough, fever) may help parents to recognize pediatric emergencies. Written material addressing pediatric emergencies is very helpful for parents in reinforcing this information.

First Aid Education

First aid education should be provided to children and families. Topics may include:

- ♥ Controlling hemorrhage
- ♥ Responding to a choking spell or other respiratory difficulty
- ♥ Helping the child who is experiencing a seizure
- ♥ Dealing with a suspected fracture
- ♥ Responding to a severely injured child
- ♥ Managing high fevers
- ♥ Caring for minor and moderate burns
- ♥ Evaluating cleansing, and bandaging a laceration, deep abrasion, or bite wound
- ♥ Caring for eye injuries
- ♥ Ingestions and poisonings

Home First Aid Kit

It would also be helpful for parents to have a home first aid kit. Contents may include:

- ♥ A list of emergency phone numbers (including poison control center)
- ♥ Adhesive strips, gauze, adhesive tape, bandage rolls
- ♥ Antibiotic ointment
- ♥ Acetaminophen preparations appropriate for the child's age
- ♥ Hydrocortisone cream
- ♥ Eye patches
- ♥ Diphenhydramine
- ♥ Sling
- ♥ Elastic bandages
- ♥ Suction bulb
- ♥ Thermometer
- ♥ Cotton balls
- ♥ Hydrogen peroxide
- ♥ Tweezers, scissors

Home Emergencies

Injury Prevention

Injuries from trauma are the leading killer of children in America. In fact, more children die from trauma related each year than all other diseases combined. Oftentimes, trauma causes irreversible injury: once the damage is done, there is not much we can offer, despite all the recent advances in medical care. Clearly, the best treatment of trauma is to prevent it. Primary care providers can offer critically important information to children and families regarding injury prevention.

An effective method of teaching injury prevention to caretakers is through a developmental perspective. Each developmental stage carries unique risks that make children susceptible to injuries. It is important to reinforce to parents that certain injury prevention and safety issues overlap or continue throughout all stages of development. An excellent reference for injury prevention and health promotion is Green, M. (1994). Bright Futures. Guidelines for Health Supervision for Infants, Children and Adolescents Arlington, Virginia: National Center for Education in Maternal and Child Health.

Emergencies at Home

Anticipatory Safety Guidance – Infants (0-12 months)

1. Use car seats that are secured and the correct size and in the appropriate location in the vehicle.
2. Ensure that the baby's crib is safe: mattress is firm, fits snugly, no stuffed animals, pillows, or heavy quilts or blankets; do not put baby on soft surface such as pillows, couch or waterbed.
3. Put baby to sleep on their back.
4. Set hot water heater thermostat <120 F.
5. Test water temperature before putting baby in bath.
6. Never leave baby alone with a young sibling or pet.
7. Never leave baby alone in tub of water or on a high surface.
8. Keep home, day care and car smoke-free.
9. Install smoke detectors and check periodically.
10. Avoid overexposure to the sun.
11. Don't drink hot liquids or smoke while holding baby.
12. Keep sharp objects, small toys, and objects, plastic bags, latex balloons away from baby.
13. Keep all poisonous substances, medications, cleaning supplies, paints, beauty aids out of sight and reach.
14. Use safety locks on cabinets, drawers; keep safety caps on all medications.
15. Do not use infant walkers at any age.
16. Empty buckets, tubs, small pools immediately. Put lid down on toilets. Ensure all swimming pools are enclosed and locked.
17. Do not leave heavy objects or hot liquids on tables with tablecloths that can be pulled down.
18. Keep plastic plugs in electrical sockets.
19. Install gates at the top and bottom of stairs.
20. Lower crib mattress.
21. Avoid dangling electrical and drapery cords.
22. Learn first aid and cardiopulmonary resuscitation (CPR).
23. Get on the floor and check for hazards.



Emergencies at Home

Anticipatory Safety Guidance – 1 to 5 years old

1. Switch to toddler car seat. When child reaches 60 pounds or head is higher than the back of the seat, switch to regular seat belts and shoulder straps.
2. Re-examine hot water heater for temperature.
3. Supervise toddlers constantly whenever they are around water; teach the child how to swim.
4. Apply sunscreen before the toddlers go outside to play.
5. Turn handles toward the back of the stove; keep toddler away from hot stoves, fireplaces, irons, curling irons, space heaters and electric tools.
6. Keep cigarettes, lighters, matches, and alcohol away from toddlers.
7. Confine toddler's outside play area within fences or gates.
8. Supervise toddlers when they are using the stairs.
9. Keep toddlers away from moving machinery, lawn mowers, overhead garage doors, driveways, street, fans.
10. Ensure toddler is wearing a helmet when riding in a seat on an adult bicycle or when riding on a tricycle or bicycle.
11. Teach children to use caution when approaching animals, especially if they are unknown or eating.
12. Never underestimate the ability of a toddler to climb: put the crib mattress at lowest rung, keep knives and hot liquids off tables.
13. Ensure that the toddler wears a life vest if boating; inflatable flotation devices do not make a toddler safe in the water.
14. Ensure that guns, if in the home, are locked up and that the ammunition is stored in a separate place.
15. Never leave the child alone in the house or in a car.
16. Ensure that playgrounds are safe.
17. Supervise all play near streets and driveways.
18. Establish and reinforce consistent, explicit and firm rules for safe behavior.
19. Teach the child how to swim and practice safety around pools and swimming facilities.



Emergencies at Home

Anticipatory Safety Guidelines – 5 to 11 years old

1. Ensure that the child wears a seat belt in the car at all times.
2. Teach the child about safety rules for the home. Conduct fire drills. Lock up electrical tools, poisons, matches. Discuss what to do in the event of a fire or emergency.
3. Teach children about safety rules when going to and from school. Teach pedestrian and neighborhood safety skills.
4. Teach rules about bicycle safety. Teach correct signals for traffic safety (right, left turns). Ensure children always wear a safety helmet when riding a bike.
5. Discuss playground safety.
6. Teach the child about sports safety, including the need to wear protective sports gear such as mouth guards or face protectors.
7. Do not allow the child to operate motorized equipment such as power lawn mowers or farm equipment.



Emergencies at Home

Anticipatory Safety Guidance – 12 to 19 years old

1. Wear a seat belt in the car/ insist that all passengers wear seat belts; follow the speed limit.
2. Learn how to swim.
3. Do not drink alcohol, especially when swimming, boating, or driving; plan to have a designated driver if drinking.
4. Always wear a helmet when on a motorcycle, all-terrain vehicle, or bicycle.
5. Wear appropriate protective gear at work and follow job safety procedures.
6. Do not carry or use weapons.



SECTION 7 – References – Equipment List

Office Equipment List

Airway Management

The following list includes supplies above and beyond what any standard clinic or office would normally carry (i.e. gauze pads, alcohol wipes, etc.)

- ♥ Oxygen source with flowmeter
- ♥ Simple face mask – preemie, infant, child, adult
- ♥ Pediatric and adult mask for bag-valve
- ♥ Self inflating bag with reservoir – 500 cc and 1000 cc
- ♥ Suction – wall or portable
- ♥ Suction catheters – Yankauer, 8, 10, 14F
- ♥ Oral airways – infant to adult sizes
- ♥ Nasal cannulas – infant, child, and adult sizes 1-3
- ♥ Optional for intubation
 - Laryngoscope handle with batteries
 - Miller blades – 0, 1, 2, 3
 - Endotracheal tubes – uncuffed - 3.0, 3.5, 4.0, 4.5, 5.0, 5.0, 7.0, 8.0
 - Styles – small, large
 - Adhesive tape to secure airway

Fluid Management

- ♥ Intraosseous needles – 15 or 18 gauge
- ♥ IV catheters, short, over the needle 18, 20, 22, 24 gauge
- ♥ Butterfly needles – 23 gauge
- ♥ IV boards, tape, alcohol swabs, tourniquet
- ♥ Pediatric drip chambers and tubing
- ♥ D5 ½ normal saline
- ♥ Isotonic fluids – normal saline or lactated Ringer’s solution

Miscellaneous

- ♥ Blood pressure cuffs – preemie, infant, child, adult
- ♥ Nasogastric tubes – 8, 10, 14F
- ♥ Sphygmomanometer manual
- ♥ Cardiac arrest board

Office Equipment List

Optional

- ♥ Portable monitor/defibrillator
- ♥ Pediatric defibrillation paddles
- ♥ Pediatric ECG skin electrode contacts (peel and stick)
- ♥ Mechanical blood pressure monitor
- ♥ Pulse oximeter with reusable (older children) and non-reusable (small children) sensors
- ♥ Device to check serum glucose
- ♥ Strips to check urine for glucose, blood, etc

Medications

- ♥ Aqueous Epinephrine – 1:1000 and 1:10,000 (1:1000 = 1 gram/1000cc or 1 mg/cc and is available as both 1 cc glass vials which must be cracked and 30 cc multiple dose vials) (1:10,000 = 1 gram/10,000cc or 0.1 mg/cc comes as a 10cc Bristoject)
- ♥ Atropine sulfate
- ♥ Dextrose in water – 50%
- ♥ Sodium bicarbonate – 1 mEq/cc (approximately)
- ♥ Calcium chloride – 10%
- ♥ Lorazepam or diazepam
- ♥ Phenobarbital
- ♥ Antibiotics, parenteral (Ampicillin, Gentamycin, Ceftriaxone)
- ♥ Methylprednisolone or Dexamethasone
- ♥ Naloxone (1 mg/cc)
- ♥ Ipecac
- ♥ Activated Charcoal
- ♥ Albuterol concentrated for inhalation (5 mg/cc) (Also supplied premixed with 2.5mg/2.5cc)
- ♥ Lidocaine 2% (20mg/cc)
- ♥ Benadryl (50mg/cc)

MOCK CODE LOG FORM

Date/Time	Scenario (Age/Diagnosis):	Participants
Evaluation Form Completed (Y/N)	Comments:	

Date/Time	Scenario (Age/Diagnosis):	Participants
Evaluation Form Completed (Y/N)	Comments:	

Date/Time	Scenario (Age/Diagnosis):	Participants
Evaluation Form Completed (Y/N)	Comments:	

EMERGENCY DRUG DOSES

DRUG	COMES AS	DOSE (WT.)	DOSE (VOL)	ADMINISTER
Epinephrine 1:10,000	0.1 mg/cc	0.01 mg/kg	0.1 cc/kg	
Epinephrine 1:1,000	1 mg/cc	0.1 mg/kg	0.1 cc/kg	
Atropine	0.1 mg/cc	0.02 mg/kg	0.2 cc/kg	
Ca++Cl 10%	100 mg/cc	20 mg/kg	0.2cc/kg	
Na Bicarbonate	1 mEq/cc	1 mEq/kg	1 cc/kg	
Dextrose 25%	0.25 gm/cc	0.5 gm/kg	2 cc/kg	
Mannitol	250 mg/cc	0.5 gm/kg	2 cc/kg	
Adenosine	3 mg/cc	0.1 mg/kg	0.03 cc/kg	
Lidocaine	40 mg/cc	1 mg/kg	0.025 cc/kg	
Narcan (Naloxone)	0.4 mg/cc	0.1 mg/kg	0.25 cc/kg	
Defibrillation	2 Joules/kg Repeat at 4 Joules/kg			
Cardioversion	0.5 Joules/kg			
PATIENTS WEIGHT				

MOCK CODE EVALUATION FORM

	YES	NO	Comments
CLINICAL			
Airway assessed initially			
Breathing then assessed			
Circulation assessed			
Initial interventions			
Protocol followed for the chosen "case"			
Patient reassessed frequently			
Secondary Survey			
ORGANIZATION			
All supplies requested were available			
Supplies were found quickly when requested			
Broselow tape used			
Arrest sheet available and/or used			
Personnel know how to use equipment properly (O2 tanks, etc.)			
Protocols available and/or used			
COMMUNICATION			
Leader communicated effectively			
Events recorded accurately			
Roles were assigned			
Office staff reported to EMS			
EMS communicated needs/plans with office staff			
Other Comments			

CODE LOG

Patient:		Date/Time:
Physician:	Nurse:	Other:
Nurse:	Nurse:	Other:

[illegible]

CODE START TIME:	HOSPITAL TO:
EMS TIME CALLED:	PHYSICIAN REFERRED TO:
EMS TIME ARRIVED:	DIAGNOSIS:
EMS TIME DEPARTED:	
PARAMEDIC:	IV/SIZE/LOCATION:
IO SIZE/LOCATION:	ETT/SIZE:

